

## SECTION 733

### MISCELLANEOUS MATERIALS

All materials for pipe, fittings, valves, valve boxes, hydrant risers, and other miscellaneous materials covered shall comply with the requirements of the individual materials set out in this Section.

#### 733.01. CAST IRON WATER PIPE, FITTINGS, VALVES, ETC.

- (a) **Materials Covered.** This item covers cast iron water pipe, fittings, valves, valve boxes, fire hydrants, and jointing materials for use in the construction, extension, or repairs of cast iron water lines.
- (b) **Pipes.**
  - 1. **Cast Iron Water Pipe.** Cast iron pipe shall conform to, and be tested in accordance with, the American Standard for Cast Iron Pipe Centrifugally Cast in Metal Molds for Water or Other Liquids, AWWA C 106, or Cast Iron Pipe Centrifugally Cast in Sand-Lined Molds for Water, AWWA C 108. Length shall be either 18 feet (5.49 m) or 20 feet (6.10 m). Strength of iron shall be 18/40 with thickness class 22 for 3 inch (76.2 mm) to 12 inch (304.8 mm) diameters, and thickness class 24 for diameters over 12 inches (304.8 mm), unless otherwise specified.

Two inch (50.8 mm) cast iron pipe shall conform to, and be tested in accordance with, the American Standard for 2 inch and 2 1/4 inch (50.8 and 57.2 mm) Cast Iron Pipe, Centrifugally Cast, for Water and Other Liquids, AWWA C 112. Lengths shall be 12, 18, or 20 feet (3.66, 5.49, or 6.10 m).
  - 2. **Ductile Iron Water Pipe.** Ductile iron pipe shall conform to and be tested in accordance with the American Standard for Ductile--Iron Pipe, Centrifugally Cast in Metal Molds or Sand--Lined Molds, for Water or Other Liquids, AWWA Designation C 151.
- (c) **Fittings.** Cast iron fittings shall conform to, and be tested in accordance with, the American Standard for Cast Iron Fittings, 2 inch (50.8 mm) through 48 inch (1,219 mm) for Water and Other Liquids, AWWA C 110. Pressure rating shall be 250 psi (1.72 MPa). All sleeves shall be the longest of lengths allowed.
- (d) **Valves.**
  - 1. **Gate Valves.** Gate valves shall conform to, and be tested in accordance with, the AWWA Standard for Gate Valves for Ordinary Water Works Service, AWWA C 500. Valves shall have double disc parallel seats, nonrising stem, vertical mounting, "O" ring stem seal, counterclockwise opening, and ends to fit the pipe or fittings to which they are attached (push-on mechanical, bell and spigot, or flanged).

They shall be Crane, Darling, Ludlow-Rensselaer, M & H, Mueller, A.P. Smith, or an approved equal.
  - 2. **Ball Valves.** Ball valves shall be: double-seated with natural or synthetic rubber, bronze, or monel metal seats; designated for 150 psi (1.03 MPa) working pressure; flanged end; "O" ring rotor bearing seals; constructed of high-tensile strength cast iron; equipped with totally enclosed manual operators, with open-closed indicator, and hand wheel with standard size square wrench nut for one-man operation at 150 psi (1.03 MPa) unbalance across the valve. Valves shall be tested by, and shall withstand without leak, a hydrostatic pressure of: (1) 250 psi (1.72 MPa) on the valve body with the rotor in the open position; and (2) 150 psi (1.03 MPa) on each side of the

valve with the opposite side open to atmosphere. Four copies of the test results and manufacturer's drawings shall be submitted for approval prior to delivery of the valve.

They shall be Allis-Chalmers, Henry Pratt, Williamette Iron & Steel, or an approved equal.

3. **Air Relief Valves.** Air relief valves shall be heavy-duty combination air release and vacuum type for 300 psi (2.07 MPa) water working pressure, tested to 300 psi (2.07 MPa), 2 inch (50.8 mm) in size. Body, cover, and baffle shall be cast iron. All internal parts shall be either highest quality stainless steel or bronze, and the inside of the valve shall be coated with rust inhibitor. They shall be Apco No. 145C, Darling, Rensselaer, or an approved equal.
4. **Check Valves.** Check valves shall be horizontally mounted, single disc, swing type with a full diameter passage providing minimum pressure loss. Valves shall be of the non-slamming type designed for the future installation of outside lever and weight. Disc faces and seat rings shall be bronze. Ends shall fit the pipe or fitting to which they are attached (push-on, mechanical, bell and spigot, or flanged).

They shall be Crane, Darling, Ludlow-Rensselaer, M & H, Mueller, A.P. Smith, or an approved equal.

- (e) **Valve Boxes.** Unless otherwise specified on the Plans, valve boxes shall be of the screw type adjustable valve box, complete with drop cover.
- (f) **Fire Hydrants.** Fire hydrants shall conform to, and be tested in accordance with the AWWA Standard for Fire Hydrants for Ordinary Water Works Service, AWWA C 502. All hydrants shall have the following: breakable connection features and a breakable coupling on the stem immediately above the bury line, both of which have a lower breaking point than the rest of the unit; 4 1/2 inch (114.3 mm) compression main valve; 6 inch (152.4 mm) inlet connection; bell, flange, or mechanical joint inlet; 4 1/2 foot (1.37 m) bury length; two 2 1/2 inch (63.5 mm) hose nozzles with National Standard threads; one 4 inch (101.6 mm) pumper nozzle; "O" ring seal; drain valve, left (counterclockwise) opening; yellow finish paint above ground line; and National Standard pentagon operating nut.

Fire hydrant extensions shall be of the proper design to accommodate the make of fire hydrant installed.

Fire hydrants shall be Darling, Mueller Improved, M & H, or an approved equal.

- (g) **Joints.** Joint cast iron pipe and fittings with any of the end types as specified below, unless a particular end type is specified. Use flange ends only where specifically noted on the drawings, except that the valve connection end of all tapping sleeves shall be flanged.

Push-on joints shall conform to, and be tested in accordance with, the American Standard for Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings, AWWA C 111.

Mechanical joints shall conform to, and be tested in accordance with, the American Standard for Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings, AWWA C 111.

Bell-and-spigot joints shall consist of square, braided, sterilized hemp and 99.73 percent pure lead caulking.

Flange joints shall conform to the American Standard for Cast Iron Pipe Flanges and Flanged Fittings, ASA B 16.1.

- (h) **Lining.** When specified, cast iron pipe and fittings shall be lined in accordance with the American Standard for Cement Mortar Lining for Cast Iron Pipe and Fittings for Water, AWWA C 104.
- (i) **Certification.** Tests will not ordinarily be made by the Materials Division on the above materials, but the materials furnished shall be recognized standard products, and the manufacturer of such products shall furnish the Engineer a type C certification.

**733.02. COPPER WATER SERVICE PIPE AND FITTINGS.**

- (a) **Materials Covered.** This item covers copper water service pipe and fittings for use in construction of water service lines.
- (b) **Copper Service Pipe.** Copper service pipe shall be a seamless copper tubing cold drawn to size. It shall be type K soft annealed and shall meet the requirements of ASTM B 88.

Sampling and testing shall be done as provided in ASTM B 88, with the exception that making the chemical analysis shall be optional with the Engineer.
- (c) **Fittings.** All fittings, including corporation stops and curb stops, shall be of cast brass or bronze and shall be finished in a thoroughly workmanlike manner. They shall be sound, clean, and free from blow holes, porous places, cracks, or any other defects affecting their strength or appearance, which would indicate inferior quality of metal. All moving parts shall be accurately fitted up so as to work smoothly and freely without binding. They shall be of a standard type commonly used and shall be the product of a recognized manufacturer of such fittings. Each casting shall bear the name or trade-mark of the manufacturer, permanently cast in the metal.
- (d) **Certification.** Tests will not ordinarily be made by the Materials Division on the above materials, but the materials furnished shall be recognized standard products and the manufacturer of such products shall furnish the Engineer a type C certification.

**733.03. GALVANIZED STEEL WATER PIPES AND FITTINGS.**

- (a) **Materials Covered.** This item covers galvanized steel pipe for use in water service lines.
- (b) **Galvanized Steel Pipe.** Galvanized steel pipe shall meet the requirements of ASTM A 53, Standard Weight Pipe. All pipe shall be first class galvanized welded and seamless steel pipe of standard mass and standard dimensions, new stock, smoothly finished, and free from any defects which might affect its strength or durability, and shall be approved by the Engineer before using.
- (c) **Fittings.** Fittings shall be galvanized and may be either of wrought iron or steel. All connections shall be standard right-hand screw threads unless otherwise noted on the Plans.

**733.04. NONMETALLIC WATERLINE PIPE AND FITTINGS.**

- (a) **Materials Covered.** Each specific type of nonmetallic pressure waterline pipe and fittings shown below shall meet the following requirements unless otherwise shown on the Plans.
  1. Asbestos-Cement Waterline Pipe and Fittings - ASTM C296.
  2. Polyvinyl Chloride (PVC) Waterline Pipe and Fittings - ASTM D1785.
  3. Acrylonitrile-Butadiene-Styrene (ABS) Waterline Pipe and Fittings - ASTM D1527.
  4. Polyethylene (PE) Waterline Pipe and Fittings - ASTM D2104.
  5. Polybutylene (PB) Waterline Pipe - ASTM D2662.

**733.05. REFLECTIVE SHEETING FOR GUIDE POSTS.**

This item covers reflective sheeting to be used in reflectorized guide posts, or any other post or barrier which requires reflectivity, and shall be in accordance with the requirements for reflective sheeting as provided in Subsection 719.04., Type II. Reflective sheeting for use on the underdrain outlet post (guide post) shall meet the same requirements. Metal backing plates (sheet) for these posts shall conform to the requirements of ASTM A 526, in minimum 30 gage (399  $\mu$ m thickness) for galvanized sheet, or ASTM B 209 Alloy 1060-H12 in minimum 406  $\mu$ m thickness. Metal bands shall be prepared to receive

the reflective sheeting by degreasing and fully cleaning or caustic etching. Wording on the band shall be as shown on the current Standard Drawing.

### 733.06. ELASTOMERIC BEARING PADS.

- (a) **Description.** This item covers elastomeric bearing pads for bearings under structural members when so specified on the Plans. The dimensions and shapes of plain and laminated pads shall be as provided on the Plans. Plain pads shall consist of elastomers only (50, 60 or 70 Durometer Hardness) and laminated pads shall consist of layers of elastomers (50 or 60 Durometer Hardness) restrained at their interfaces by bonded laminates.
- (b) **Materials.** Materials, fabrication, fabrication tolerances, markings and certification, testing, and installation shall conform with the requirements of the latest revision of the AASHTO Standard Specifications for Highway Bridges.

Unless otherwise shown on the Plans, the shear modulus for the Durometer hardness indicated on the Plans shall be as follows:

Durometer Hardness	Shear Modulus, 73°F, psi (22.8EC, MPa)
50	110 (0.76)
60	150 (1.03)
70	235 (1.62)

Unless otherwise noted on the Plans, all elastomer compounds shall be classified as being of low temperature Grade 2.

The edge cover of embedded laminates or connection members for all steel reinforced bearing pads shall be 1/8 inch (3.2 mm).

If it is specified on the Plans that the anchor plate is to be bonded to the bearing pad, then it shall be a heat-bonded connection made by the pad manufacturer during the vulcanization process.

- (c) **Acceptance.** Acceptance of the bearing pads will be based on the following:
1. Seven copies of the shop drawings shall be submitted to the Bridge Engineer for approval. Fabrication shall not begin until the pad manufacturer receives such approval.
  2. A type A certification showing compliance with these Specifications shall be furnished by the Contractor.
  3. A sample, consisting of one finished bearing pad per size or type, per project, shipment or lot, shall be submitted to the Materials Laboratory for dimensional and Durometer Hardness checks, and, whenever appropriate, and with the direction of the Materials Engineer, laboratory tests of the full-size bearing pad shall be conducted.

Testing of the bearing pads, conducted by the Department or others in its charge, shall be of a nondestructive nature. Upon completion of the required tests, sample bearing pads may be picked up from the Materials Laboratory by the pad manufacturer or their representative. Samples of plain bearing pads for slab bridges or other pads deemed cumbersome by the Bridge Engineer need not be submitted to the laboratory. The Engineer shall document the dimensional check of all bearing pads.

**733.07. NONSHRINK GROUT.**

- (a) **General.** Nonshrink grout shall consist of a mixture of portland cement, fine aggregate, water, and an approved nonshrink admixture.
- (b) **Materials.**
1. **Portland Cement, Water and Aggregate.** Portland cement, mixing water, and aggregate shall conform to Section 701. The gradation requirements of the aggregate will conform to the following:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 16 (1.18 mm)	100
No. 50 (300 µm)	20-50
No. 200 (75 µm)	0-10

2. **Nonshrink Admixture.** Nonshrink admixture shall be the type manufactured under a trade name for use in nonshrink grout and approved by the Materials Engineer prior to use.
  3. **Premix.** Manufacturer's premix formulations may be used when approved by the Materials Engineer prior to use.
- (c) **Nonshrink Mortar.**
1. **Proportioning.** Unless otherwise specified by the manufacturer of the nonshrink admixture, the dry materials shall be proportioned on a 1:1:2 basis by mass, or as follows:

94 pounds (42.64 kg) Portland Cement 100 pounds (45.36 kg) sand 200 pounds (90.72 kg) nonshrink admixture
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2. **Mixing.** The proportioned materials shall be combined and mixed until thoroughly blended. If the sand is noticeably wet, the quantity of free moisture shall be determined as a percentage of the dry mass and the mass of sand adjusted accordingly. Water shall be added in increments until the desired consistency has been obtained. The mixing water will be estimated as a percentage of the total mass of the dry materials. Mortar not used within 20 minutes after completion of mixing shall be discarded.  
*NOTE: Retempering the mortar will not be permitted.*

**733.08. WATERSTOPS.**

- (a) **General.** This item covers the requirements for plastic waterstops and rubber waterstops to be used in construction joints of structural concrete, when shown on the Plans, in reasonably close conformity with the dimensions and location shown on the Plans or established by the Engineer.
- Waterstops shall have a dense, homogeneous cross section and shall be produced in continuous lengths not to exceed 100 feet (30.48 m). If any field splices are necessary, they shall be made in accordance with the manufacturer's instructions.
- (b) **Materials.** When a particular type of material is not shown on the Plans, either plastic or rubber material is acceptable.
- Subject to visual inspection and approval by the Engineer, material from an approved source will be accepted on the basis of the manufacturer's identification markings showing the appropriate

grade of material. To qualify as an approved source of material, the manufacturer shall submit to the Materials Engineer certification of tests of the name product showing compliance with these Specifications.

1. **Plastic Waterstops.** The waterstops shall be extruded from an elastomeric plastic compound, the basic resin of which shall be a polyvinyl chloride (PVC). The compound shall contain any additional resins, plasticizers, stabilizers, or other materials needed to insure that, when the material is compounded, it will meet the performance requirements given in this Specification.

Sampling shall be in accordance with ASTM Designation D 15 Methods of Sample Preparation for Physical Testing of Rubber Products and Federal Test Method Standard No. 601 Rubber; Sampling and Testing.

The material shall meet the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Property Requirement</u>
Tensile Strength (die III), psi (MPa), minimum	4111 <sup>a</sup>	1750 (12.07)
Ult. Elongation (die III), %, minimum	4121 <sup>a</sup>	350
Low Temp. Brittleness, no failure such as cracking or chipping at, °F (EC)	ASTM D 746	-35 (-37.2)
Stiffness in flexure, 1/2 inch (12.7 mm) Span, psi (MPa), minimum	ASTM D 747	400 (2.76)

<sup>a</sup> Federal Test Method Standard No. 601.

2. **Rubber Waterstops.** The material for rubber waterstops may be a natural rubber, suitable synthetic rubber, or a blend of natural and suitable synthetic rubber.

Sampling shall be in accordance with ASTM Designation D 15 Methods of Sample Preparation for Physical Testing of Rubber Products and Federal Test Method Standard No. 601 Rubber; Sampling and Testing.

The material shall meet the following requirements:

<u>Property</u>	<u>Test Method<sup>a</sup></u>	<u>Physical Requirements</u>
Tensile Strength (die III), psi (MPa), minimum	4111	2500 (17.24)
Hardness, Shore Diameter, Type A	3021	60-70
Ult. Elong. (die III), %, minimum	4121	450
300% Modulus, psi (MPa), minimum	4131	900 (6.21)
Water Absorp., 7-day immersion, 73.4°F±2°F (23±1 EC), %, maximum	6631	5
Compression Set, %, maximum	3311	30
	or ASTM D 395, Method B	
Tensile Strength after aging Oxygen bomb method, %, minimum	7111	80

<sup>a</sup> Federal Test Method Standard No. 601.

- (c) **Acceptance.** A type D certification in accordance with Subsection 106.04 shall be required.

**733.09. SLURRY GROUT.**

- (a) **Description.** This item covers a slurry type grout for stabilizing and undersealing portland cement concrete pavements by pressure grouting method.
- (b) **Materials.** The grout shall consist of a mixture of portland cement, fly ash and water proportioned as approved by the Engineer.

Portland cement, fly ash, water and approved admixtures shall meet the following requirements of the Subsections:

Portland Cement	701.02
Admixtures	701.03
Water	701.04
Fly Ash	702

- (c) **Mix Designs and Tests.** Submit in advance to the Materials Engineer a proposal for materials to be used in the grout mixture. Also submit job mix test results of the grout from an independent laboratory, showing the following: 7 day strengths (ASTM C 942); flow cone rate (Corps of Engineers Method) (ASTM C 939); shrinkage and expansion (ASTM C 940 or C 827); and time of initial set (ASTM C 403 or AASHTO T 197). The 7 day strength shall not be less than 800 psi (5.52 Mpa), and the flow cone rate shall be 10-16 seconds.

**SECTION 735  
MATERIAL FOR ROADSIDE  
DEVELOPMENT AND EROSION CONTROL**

**735.01. DESCRIPTION.**

These Specifications establish the material requirements for roadside development and erosion control.

**735.02. SODDING AND SPRIGGING MATERIALS.**

- (a) **General.** Bermudagrass sod or sprigs to be used as source material shall be a thick stand of common bermudagrass growing on fertile topsoil. Types of bermudagrass other than "Common" may not be used unless specified or approved by the Engineer. The vegetative parts (rhizomes, stolons, and roots) of bermudagrass shall be viable as indicated by a dense, deep-rooted stand.

The source for sod and sprigs shall be free of reproducing parts of weeds classified as "Prohibited Noxious" and shall be as free of other legally "Restricted Noxious" plant materials as required by the Oklahoma Department of Agriculture Seed Law. The proposed source of sod or sprigs will be approved by the Engineer before the beginning of sodding or sprigging operations. Prior to approval, the area shall not be tilled or mowed. After approval, all vegetative growth exceeding 3 inches (75 mm) in height shall be mowed and the residue removed prior to harvesting the sod or sprigs.

The sod or sprigs shall be moist when excavated from the source and shall be kept moist until planted. Watering of the sod source, if to be measured for payment, shall be performed when and as directed by the Engineer. Sod in storage which becomes dry, shall not be remoistened and used, but shall be discarded.